



HEALTH PSYCHOLOGY | RESEARCH ARTICLE

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Erin Morris Miller, Brian M. Kelley, Christian Midgett and Chelsea Parent

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*Corresponding author: Erin Morris Miller, Department of Psychology, Bridgewater College, 402 East College Street, Bridgewater, VA 22812, USA
E-mail: emmiller@bridgewater.edu

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Substance use references in college students' diverse personal music libraries predicts substance use behavior

Erin Morris Miller^{1*}, Brian M. Kelley¹, Christian Midgett¹ and Chelsea Parent²

Abstract: *Aims:* Musical preferences have been associated with substance use, but research has not fully considered the effect of the changes in music consumption in the digital age. We examined the effect of self-chosen music on substance use behaviors. *Methods:* Sixty college-age students volunteered to participate in exchange for class credit. Self-reported substance use behavior, sensation seeking, and school commitment were measured through surveys. Music preferences were assessed through self-report of the top 20 most played songs from each participant's digital music devices. Each song was evaluated for references to substance use. *Findings:* Song and genre choices in private digital collections varied widely. Listening to music with a greater number of references to substance use was associated with greater reported substance use behaviors. *Conclusion:* The relationship between substance use and music preference in this study of idiosyncratic music libraries remains consistent with previous research that examined the effect of preferred genre alone.

Subjects: Area Studies; Behavioral Sciences; Social Sciences

Keywords: adolescence; music; substance use

1. Introduction

Substance use among adolescents and emerging adults is a major concern on college and university campuses (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2013; Hingson, Zha, & Weitzman, 2009).

ABOUT THE AUTHORS

Drs. Brian M. Kelley and Erin Morris Miller are professors at Bridgewater College, a small liberal arts college in Bridgewater, Virginia. Dr Kelley is a neuropsychologist specializing in substance use and abuse and public mental health. Dr Miller is an educational psychologist specializing in intelligence and creativity. Chelsea Parent and Christian Midgett graduated from Bridgewater College in 2014. Parent recently completed a master's program in education and human development from George Washington University. Midgett currently works in the management development program at GEICO. This research began through a program designed to involve undergraduate psychology majors in small-scale research projects studying substance use and abuse on campus. Other projects involved cognitive modeling of conceptions of substance abuse and a study of stress and substance use.

PUBLIC INTEREST STATEMENT

"Check out my technique, just weed let it fold. Shit, I've been smokin' since I was 14 years old," sings Wiz Khalifa in the song *French Inhale*. References to substance use in popular music is nothing new (just listen to Curtis Mayfield or Fats Waller.) What is new is the way that music is consumed. Through the use of digital media, individuals can create their own personal music worlds with hundreds of songs in their playlist without depending on radio or a brick-and-mortar store. The college students in this study had extremely diverse music libraries. But regardless of this fact, those individuals who listened to music with a larger number of references to illicit substances tended to smoke tobacco, drink alcohol, smoke marijuana, or abuse prescription drugs more often than college students who did not listen to music that included lyrics about substance use.

Adolescents are also a key demographic for advertising executives seeking to increase market share and establish brand loyalty. Strategies regarding how to best capture the teen market are common topics of marketing and advertising websites (i.e. Connon, 2014; Mann, 2010; Schiff, 2007). However, as teens become more sophisticated consumers, it becomes more and more difficult to reach them through traditional channels (4Imprint, 2011). Although government regulations in multiple countries regulate how substances such as alcohol and tobacco can be advertised, with the explicit goal of limiting direct advertising to children and teenagers, indirect advertising is prevalent through movies, television and music (Jernigan, Ross, Ostroff, McKnight-Eily, & Brewer, 2013; MediaSmarts, 2016; Ross et al., 2014).

Of course the purpose of most media is to influence behavior whether that be purchasing alcohol or listening to a certain type of music. Level of media exposure affects behavior (Collins, Ellickson, McCaffrey, & Hambarsoomians, 2007; Morgenstern, Isensee, Sargent, & Hanewinkel, 2011; Weiss et al., 2006). Music can be considered a “super peer” in that it provides information about social norms regarding the enjoyment of substance use with little information about the repercussions of such abuse (Scull, Kupersmidt, & Erasquin, 2014; Strasburger, Jordan, & Donnerstein, 2010). In addition, fans of music may select friends with use patterns that reinforce their own music choices (Mulder et al., 2010). It is clear that media messages affect behavior. But less is known about the influence of personal music choice on substance use and abuse related behavior.

Choice of music and patterns of listening are a bit different from other forms of media. For the most part, exposure to advertising is passive. It pops up on websites, billboards, and in commercials. One’s musical choices can be deliberate and purposeful. Adolescents regard music as important to their daily lives and spend considerable money and time on music consumption (Lonsdale & North, 2011). Portnuff, Fligor, and Arehart (2011) found that their sample of young adults listened to an average of 14.3 h of music per week with a considerable standard deviation of 10.6 h. Individuals use music for myriad reasons, including impression management, background accompaniment, appreciation, emotional regulation, and intellectual processing (Bakagiannis & Tarrant, 2006; Chamorro-Premuzic & Furnham, 2007; Kistler, Rodgers, Power, Austin, & Hill, 2010; Lonsdale & North, 2011; Tarrant, North, & Hargreaves, 2001, 2002). Small correlations between personality variables and musical preferences have been found in several studies indicating that liking intense and rebellious genres such as rap, metal, hip hop, and rock is associated with higher psychoticism and sensation seeking (Chamorro-Premuzic & Furnham, 2007; North, Desborough, & Skarstein, 2005; Rentfrow & Gosling, 2003). However, many predictor variables such as personality, self-esteem, sex, and income explain only a small percentage of musical taste variance (North, 2010).

There does seem to be a relationship between music listening choices and substance use and abuse. Chen, Miller, Grube, and Waiters (2006) asked college students to check yes/no to different genres of music to indicate the types to which they most often listened. Preference for rap music was associated with alcohol use, illicit drug use and aggressive behavior. In a study of Dutch students aged 13–16, punk/hardcore, techno/house, and reggae music were associated with more substance use while pop and classical music were associated with less use. Music preference explained 2–5% of the variance in substance use behavior after controlling for group effects, parent, and peer drug use (Mulder et al., 2009). Primack, Douglas, and Kraemer (2009) asked 959 high school students to report the number of hours per day that they listened to music and their favorite musical artists. Use of cannabis was associated with having a favorite artist with a greater number of substance use references in the artist’s most popular songs. Use of cannabis was also associated with lower grades, less demanding parenting, higher sensation seeking, and higher rebelliousness. In these correlational studies, it is important to note that it is not clear whether individuals who use substances are drawn to a certain kind of music or whether the music influences the person to use substances. In one of the few non-correlational studies, Engels, Slettenhaar, Ter Bogt, and Scholte (2011) found that individuals spent more money on alcoholic beverages in a bar setting when music was played that had alcohol references as compared to when similar music without references were played. It is likely that there is a combination of direct and indirect effects linking music and substance use

involving cognition, peer relationships, and parental factors (Kam, Wang, & Harvey, 2014; Scull et al., 2014; Slater, 2007; Slater & Henry, 2013).

There has been an increase in the prevalence and glamorization of different substances that are often abused, such as alcohol, in some genres such as rap and hip-hop (Herd, 2014; Primack et al., 2009). However, as several of the previous studies of the relationship between music preference and substance use have been undertaken by researchers in Europe (i.e. Bakagiannis & Tarrant, 2006; Morgenstern et al., 2011; Mulder et al., 2009, 2010), much of the research did not include Country music as a consideration. This genre is more popular in the United States. An evaluation of alcohol brand references in US popular music focusing on Pop, Country, Urban, and Rock found that 26% of songs on the *Billboard Magazine* lists of top songs mentioned alcohol (Siegel et al., 2013). Within the genres, 38% of Urban songs mentioned alcohol and 22% of Country songs mentioned alcohol.

Previous research on the relationship between music and substance use has often focused on favorite genre, artist or most popular songs as defined by *Billboard Magazine* (Chen et al., 2006; Mulder et al., 2009, 2010; Rentfrow & Gosling, 2003; Siegel et al., 2013). However, there has been a change in how music is accessed and consumed with a trend toward digital downloads and streaming rather than dependence on radio. At least 75% percent of young adults ages 18–29 own a device that plays MP3 music files (Arbitron, Inc & Edison Media Research, 2013; Rideout, Foehr, & Roberts, 2010). The Apple iPod can store nearly 10,000 songs, allowing an unprecedented amount of choice of music. Young adults tend to create and manage playlists to match their mood state from moment to moment; creating a privatized sound world in which they can actively engage (Bull, 2005; Krause, North, & Hewitt, 2014; Prior, 2014; Skånland, 2013). Ferguson, Greer, and Reardon (2007) found that among college students who had devices that played music, the mean number of songs per device was 1,270 with a standard deviation of 1,452 songs. Those participants who used Ipods and similar devices also tended to listen to less radio. Research conducted by Arbitron, Inc and Edison Media Research (2013) indicate that for 12–24 year olds, the top three ways to keep up with new music is through friends and family (79%), Youtube (77%), and FM/AM radio (72%). This change may have an effect on the relationship between substance use and music choice. The current research investigated the patterns of relationships among American undergraduates' choices in music in their private digital collections and substance use behavior.

2. Method

2.1. Sampling and data collection

Participants were 60 undergraduates enrolled in a General Psychology course at a small liberal arts college in the Southeastern United States. The participants represented a variety of majors as the course was for general education credit. Students in the course were required to participate in a set number of hours of research or complete an alternate activity. The mean age was 19 (SD = 1.9). Forty percent of the sample was male and 60% were female. Eighty-eight percent of the population self-identified as White. Five percent identified themselves as Black, 4% identified themselves as Hispanic, and 3% reported themselves to be Asian or Pacific Islander. Forty-nine percent of the participants were first generation college students.

2.2. Measures

Substance use was modeled as use of tobacco, marijuana, alcohol, and abuse of prescription drugs. Although these represent different types of substance use, they are often grouped together as a measure of risky behavior (Ewing et al., 2015; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016; Mulder et al., 2010). Participants were asked to report yes or no to whether they had ever used each of the substances and whether they had used each of the substances in the last 30 days. The data were coded such that answers of Yes were recorded as 1s and answers of No were recorded as 0s. Sums of these scores yielded a "Total Use" measure, a measure for "Use in the Last 30 Days," and a measure for "Ever Use" of the substances.

Several socio-demographic and personality characteristics that have been shown to be related to substance abuse were measured (King, Nguyen, Kosterman, Bailey, & Hawkins, 2012; Mallett, Turriss, Ray, Stapleton, & Abar, 2011; Marcotte, Bekman, Meyer, & Brown, 2012; Quinn, Stappenbeck, & Fromme, 2011). Demographic variables included age, gender (male vs. female), and parental education (no college vs. college or above). Sensation seeking was measured using the Brief Scale of Sensation Seeking (BSSS-4; Stephenson, Hoyle, Palmgreen, & Slater, 2003). Hoyle, Stephenson, Palmgreen, Lorch, and Donohew (2002) in a study of 1,263 middle and high school students found a coefficient alpha of 0.76 and the average corrected item-total correlation was 0.47. Total sensation seeking was calculated by totaling all items. School commitment was measured using a six-item scale developed by Brown, Miller, and Clayton (2004) which was found to have a coefficient of alpha of 0.75. Total school commitment was calculated by totaling all items. Perceived achievement was operationalized as high school GPA and desired final degree (BS/BA, Masters/Professional Certificate or MD/PhD).

Exposure to drug references in music was estimated by a content analysis of MP3 players or similar devices. During a study session on media influences led by upperclassmen majoring in psychology, participants listed the 20 most frequently played songs on their MP3 players or similar devices. This can be accessed using a “Play Count” or similar function on the device to sort the songs. Participants also reported an estimated number of minutes per day that they listened to music and indicated their favorite genre of music from the following list: *Pop* (Top 40), *Adult* (Classical and Jazz), *Country* (Bluegrass, Traditional, Nashville), *Urban* (Rap, HipHop, Soul), *Hard* (Punk, Techno, House), and *Other*.

2.3. Data analysis

Four trained undergraduate research assistants independently accessed the lyrics for each of the 20 songs reported by each of the participants using the Google search engine. They then counted the number of drug and alcohol references in each song. The coders used Urban Dictionary.com to familiarize themselves with slang terms for substance use. The total number of references was used as the measure of influence. Inter-rater agreement and kappa statistics were computed for each of the songs coded and there was excellent agreement among the coders; minimum agreement was 89%. The research assistants compiled a master list of the different artists included in participants’ lists of songs. The lead author labeled each of the artists with the predominant genre in which they worked using information from Google searches. A second research assistant independently labeled the artists. Discrepancies were resolved using the first genre listed in Wikipedia.com. Discussion among the researchers led to a final list of genre labels: Rock (rock, metal, indie rock), Urban (rap, hip hop, R&B), Country, Pop, Dance/Electronica, Modern Classic (music first released before 1994), Christian, Folk, and Other.

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 22.0 (2013). Descriptive statistics were compiled. Chi-square and *t*-tests were used to compare group differences in music references and substance use behavior. Multiple regression was used to assess whether references to substance use in music can predict substance use behavior beyond the variability predicted by age, sensation seeking, school commitment, hours listening to music, and GPA.

3. Results

3.1. Parental education

Independent samples *t*-test results yielded no significant difference between males and females in the number of parents who had completed a BA/BS or beyond ($M = 38.5$, $SD = 25.1$) and those students whose parents did not have a college education ($M = 47.2$, $SD = 34.7$).

3.2. Music characteristics

The breadth and variety of the top 20 most played songs and artists was surprising. It was anticipated that there would be substantial overlap and that many participants would report listening to

songs from the Billboard Hot 100 for 2013–2014 (the years in which the data collection took place). However, this was not the case. Although 83% of the artists listed by Billboard magazine were listed by at least one participant, there was considerable diversity in the songs across the sample. Four hundred and eighty-two different *artists* were represented. There were 884 different songs analyzed. Of these, several artists were listed relatively more often. Sixteen participants listed songs by Florida Georgia Line. Fourteen listed songs by Luke Bryan. Thirteen listed songs by Miley Cyrus. Twelve participants listed songs by Drake. Eleven listed songs by Imagine Dragons, Katy Perry, or Jason Aldean. An example of a participant’s list can be seen in Table 1.

Participants found it difficult to choose a single favorite musical genre (see Table 2). The most frequently endorsed genre was Country music with 44 percent of participants choosing this as their most listened to type of music. The next most frequently endorsed was Pop with 23%, followed by Urban and Other at 13%, and finally Hard/Rock with 3% choosing this genre. Content analysis of the most frequently played songs suggested that students listened to multiple genres. Twenty-five percent of the artists worked primarily in Rock. Twenty-two percent were part of the Urban genre. Fifteen percent of the artists were Country music performers and an additional 15% were Pop music artists. Ten percent of the artists were those whose songs were released prior to 1994 and were designated as Modern Classic artists. Dance/Electronica artists made up 6% of the listed songs, and Christian music artists were 3% of the list. The remaining songs were instrumental and show tunes. There was a wide range in the number of hours spent listening to music each day ($M = 3.41$, $SD = 3.73$). The mean number of references to drugs in listed songs was 78.9 ($SD = 28.8$).

3.3. Illicit drug use

Levels of substance use in the sample were similar to those reported in a large-scale national study of adolescent drug use (Johnston et al., 2016). Table 3 presents the percent of students who indicated use of the different substances. Eighty-seven percent of participating students had tried alcohol. Forty-seven percent of the sample had tried marijuana. Fifty-two percent of college students in the sample had tried tobacco. Twenty-seven percent of the participating students had taking a

Table 1. Example participant list of top 20 most played songs

Song	Artist
Helluva life	Frankie Ballard
Come and get it	Huey Mack
Don't ya	Brett Eldridge
Get me some of that	Thomas Rhett
I wish	Sammy Adams
We can't stop	Timeflies
Out Like that	Luke Bryan
No faith in Brooklyn	Hoodie Allen
Floats my boat	Aer
Hey girl	Billy Currington
I see you	Luke Bryan
Talking to myself	Chiddy Bang
French inhale	Snoop Dog & Wiz Khalifa
Bad habits	Brass Knuckles
Show Me	Kid Ink
Drink on it	Blake Shelton
Miss Jackson	Panic! At the Disco
Or Nah	Ty Dolla \$ign
The monster	Eminem ft. Rihanna
Sweet Annie	Zac Brown Band

Table 2. Favorite genres and genre content analysis

Genre	Participant endorsed (%)	Content analysis of lists (%)
Country	44	15
Pop	23	15
Urban	13	22
Other	13	23
Hard/rock	3	25

Table 3. Participants' reported substance use

	Ever tried the substance (%)	Use in last 30 days (%)
Alcohol	87	58
Marijuana	47	13
Tobacco	52	27
Prescription drugs	27	8

prescription drug that was not prescribed to them. Current use was lower within the sample. Fifty-eight percent of students reported drinking alcohol, 13% reported smoking marijuana, 27% reported using tobacco products, and 8% reported abusing prescription drugs in the past 30 days.

The mean reported Total Use score was 3.18 (SD = 2.04). Independent samples *t*-tests showed no significant difference between males and females in regard to reported total substance use ($M_M = 3.7$; $M_F = 2.9$); however, there was a significant difference when considering use during the previous 30 days ($M_M = 1.5$, SD = 1.14; $M_F = .78$, SD = .87), $t = 2.78$, $p < .01$. Pearson's Chi-Square analyses comparing males and females for use of individual substances (marijuana, alcohol, tobacco, and prescription drugs) indicated no significant difference in the "Ever Used" categories. There was no significant difference in the "Last 30 Days" categories for alcohol and prescription drugs. Males were more likely than females to have used Marijuana ($\chi^2 = 4.71$, $p < .05$) and Tobacco ($\chi^2 = 4.60$, $p < .05$) in the last 30 days. Twenty-four percent of males had used marijuana and 42% had used tobacco products in the last 30 days. For females, 6% had used marijuana and 17% had used tobacco products in the last 30 days. There was no significant difference in total use nor use in the last 30 days between participants whose parents had completed their BS/BA and those whose parents had not completed college.

A stepwise multiple regression was conducted to evaluate whether age, sensation seeking, school commitment, high school GPA, and hours listening to music each week contribute to the prediction of total substance use in the last 30 days beyond that which is predicted by references to substance use in participants' personal music libraries. The correlation matrix is presented in Table 4. At step 1 of the analysis, music references to substance use was entered into the regression equation and was significantly related to substance use in the last 30 days, $F(1, 55) = 8.73$, $p < .005$. The multiple correlation coefficient was .37, indicating that 14% of the variance in substance use could be accounted for by references to substance use in music. Sensation seeking ($t = .78$, $p > .05$), school commitment ($t = -.85$, $p > .05$), age ($t = -1.50$, $p > .05$), high school GPA ($t = -.48$, $p > .05$), and hours listening to music each week ($t = -1.61$, $p > .05$), did not enter into the equation at step 2 of the analysis. Thus, the regression equation for predicting substance use behavior in the last 30 days was:

$$\text{Predicted Total Thirty Day Use} = .014 \times \text{Total References to Substance Use} + .499$$

Table 4. Correlations among key demographic and behavioral variables

Measure	1	2	3	4	5	6
1. Total 30 days substance use	–					
2. Total drug references in songs	.36**	–				
3. School commitment	–.25	–.39**	–			
4. BSS-4	.04	–.13	–.10	–		
5. Age	–.21	–.09	.18	–.20	–	
6. High school GPA	–.10	–.16	.31*	–.14	–.29	–

Note: BSS-4 = Brief scale of sensation seeking.

* $p < .05$.

** $p < .01$.

4. Discussion

The relationship between references to substance use in personal music libraries and substance use behaviors confirmed the findings of previous research. The relationship between musical choice and substance use is informative but many different mechanisms may be at play. Miranda, Gaudreau, Morizot, and Fallu (2012) discuss several different models that may be used when interpreting correlational research studying music choice and substance use based on developmental psychopathology: (1) common cause model; (2) mediator model; (3) protective factor model; (4) risk factor model; and (5) compensatory factor model. The common cause model looks for a secondary factor that has a causal influence on both behaviors. Sensation seeking has been suggested as having a causal influence on both substance use and music choice and several studies have found sensation seeking to be a significant predictor of both behaviors (i.e. Chen et al., 2006; Miller & Quigley, 2012; Wood, Cochran, Pfefferbaum, & Arneklev, 1995; Zuckerman, 2007). The current study did not find a significant effect for sensation seeking, which was unexpected. But this does not rule out the possibility of there being another causal factor.

The mediator model looks for a variable that mediates the relationship while not necessarily having a causal role. One possible mediator is peer substance use, which may be affecting both substance use behavior and music choice (i.e. Abadi, Shamblen, Thompson, Collins, & Johnson, 2011; Bauman & Ennett, 2006; Kirst, Mecredy, Borland, & Chaiton, 2014; Wood, Read, Palfai, & Stevenson, 2001). The protective factor model would apply in the case of individuals avoiding certain types of music and thus protecting them from the influence of substance use references.

The risk factor and compensatory factor models involve behaviors that predict higher or lower substance abuse. Based on these models, the interpretation of the findings would be that choosing music that includes references to substance use puts college students at risk for abuse of alcohol, marijuana, tobacco, or prescription drugs. The direction of the relationship is not specified. It is possible that substance use behavior leads to seeking music that confirms these behaviors as the norm or that listening to the music that has references to substance use leads to increased substance abuse. Choosing drug-friendly music is a red flag suggesting concern about possible behavior, but one should consider that there is likely a complex relationship involving multiple social variables.

The lack of a positive correlation between sensation seeking and substance use was unexpected. This may be attributed to a smaller sample size. It is also possible that the use of a shorter instrument (four questions) affected the results. Although the Brief Scale of Sensation Seeking has been shown to have sufficient convergent validity (Stephenson et al., 2003), perhaps a longer scale would have been a more valid measure and resulted in a stronger relationship. An alternate notion is the idea that religiosity may moderate the relationship between sensation seeking and substance use (Galbraith & Conner, 2015). As the study took place at a religiously affiliated college which draws students who tend to espouse religious and spiritual attitudes, this factor may have influenced the results.

One of the most surprising findings was the sheer number of songs represented on the participants' lists of frequently listened to music. Although the artists listed on Billboard's Hot 100 were certainly represented, it was not necessarily the same songs. Further, there were many songs and artists that were not part of Billboard's list. There does seem to be a trend toward the creation of a personalized music space as suggested by Bull (2005). This possible change in how music is accessed and used has implications for the study of musical influences that are based on evaluation of song indexes such as Billboard's Top 100.

4.1. Limitations and further directions

The generalizability of this study is affected by its small sample size. The intensive labor involved in coding the substance use references in the songs, combined with the lack of repeated songs in the lists was a barrier to having a large nationally representative sample. The sample was relatively homogenous in self-reported race with the majority of participants indicating that they were White. Replication of the results with participants from other racial and cultural groups is needed to confirm the findings. The study used self-reporting of behavior and most frequently listened to songs; which relies on the honesty of participants. The students may have been trying to manage how they appeared by not being honest about behavior or patterns of music preferences.

Future research should examine how individuals chose music and why, given the infinite variety made possible by technology and the potential effect that music has on behavior. Music choice and preferences may mirror behavior and personality or may directly affect behavior during situations that often include music such as driving (Carpentier, Knobloch, & Zillmann, 2003; Fairclough, van der Zwaag, Spiridon, & Westerink, 2014; Gardstrom, 1999; Groene & Barrett, 2012). The range and variability of the song choices indicate that individuals may be more idiosyncratic in their music choices than previously assumed. This has implications beyond the study of the influence of media on substance use behavior to the study of music's role in cultural and developmental psychology in general.

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Competing Interest

The authors declare no competing interests.

Author details

Erin Morris Miller¹

E-mail: emmiller@bridgewater.edu

ORCID ID: <http://orcid.org/0000-0002-9448-037X>

Brian M. Kelley¹

E-mail: bkelly@bridgewater.edu

ORCID ID: <http://orcid.org/0000-0003-4860-6506>

Christian Midgett¹

E-mail: cnm003@eagles.bridgewater.edu

Chelsea Parent²

E-mail: cmp006@gwmail.gwu.edu

ORCID ID: <http://orcid.org/0000-0002-2582-4415>

¹ Department of Psychology, Bridgewater College, 402 East College Street, Bridgewater, VA 22812, USA.

² Graduate School of Education and Human Development, George Washington University, 2121 Eye Street, NW, Washington, DC 20052, USA.

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